
Existing Facility

Eastern Region
SR 291 Route Development Plan
Freya Street to Scotts Valley Road

Right of Way

Approximate widths from centerline of existing City and WSDOT right-of-way along the SR 291 RDP corridor are:

City Principal Arterial, MP Back -2.48 to MP 0.00, Undivided Multilane – 48 feet to 77 feet

Urban Principal Arterial, MP 0.00 to MP 3.01, Undivided Multilane – 30 feet to 65 feet

Urban Principal Arterial, MP 3.01 to MP 5.22, Undivided Multilane – 30 feet to 175 feet

Urban Minor Arterial, MP 5.22 to MP 6.33, Three-Lane – 75 feet to 100 feet

Urban Minor Arterial, MP 6.33 to MP 7.53, Two-Lane – 30 feet to 80 feet

Rural Collector, MP 7.53 to MP 22.31, Two-Lane – 30 feet to 240 feet

Per WSDOT Design Manual, Figure 440-7a, the recommended right-of-way widths for a Non-NHS Collector route are:

	Undivided Multilane		Two-Lane					
Design Class	C-1		C-2		C-3		C-4	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
DHV*	Over 900		Over 501		301-500		300 and Under	
Minimum Right-of-Way	150 ft.	80 ft.	120 ft.	80 ft.	120 ft.	80 ft.	100 ft.	80 ft.

*DHV in Design Year – DHV is the Average Daily Traffic (ADT) multiplied by the percentage of ADT occurring in the peak hour (K).

There are numerous locations where existing right-of-way along the SR 291 RDP corridor is less than WSDOT recommendations.

Signals

Within the limits of this SR 291 RDP corridor, signals were activated on the dates specified at the following locations:

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Cross Street	Location (MP)	Activation Date
Freya Street to Division Street		
Freya Street	MP Back –2.48	November 20, 1984
Market Street	MP Back –2.16	July 07, 1963
Crestline Street	MP Back –1.51	July 03, 1970
Nevada Street	MP Back –0.74	November 27, 1967
Addison Street	MP Back –0.37	January 24, 1972
Division Street to Scotts Valley Road		
Division Street	MP 0.00	1958
Wall Street	MP 0.50	February 08, 1960
Monroe Street	MP 0.66	January 18, 1960
Maple Street	MP 1.12	May 15, 1970
Ash Street	MP 1.18	1966
Alberta Street	MP 1.77	August 22, 1978
Indian Trail Road	MP 2.21	April 04, 1975

Bridges and Structures

There is one bridge within the SR 291 corridor. A description of that structure is provided below.

Location	Bridge Name & Number	Type of Structure	Width	Length	Year Built
MP 10.04	Little Spokane River, Bridge No. 291/6	Prestressed Concrete Girder	28	180	1966

A measure of a bridge's ability to carry vehicle loads, termed structural capacity, determines the assigned "load rating". The load rating identifies whether or not a bridge is "posted" for legal weight vehicles or if the bridge is "restricted" for overweight permit vehicles. Currently, there are no vehicle weight restrictions on this structure. Bridge Condition Reports provide additional details regarding these structures. This report can be found in Appendix C.

Roadway Design Elements

The alignment of a highway greatly impacts the environment, the structure of surrounding communities, and the motoring public. A variety of design elements are carefully combined to provide a highway facility that safely and efficiently serves the motoring public, consistent with the planned function of the facility. Each alignment design element should complement other elements to produce a consistent, safe, and efficient design. There are several principal elements of design common to all highways. These include horizontal and vertical alignment, sight distance, superelevation, and roadway widths. This RDP will address these principal elements only. As shown in Design Matrix 5 (Appendix B), there are many additional design elements that should also be evaluated during project development phase.

Terrain

As differentiated in the 2004 WSDOT State Highway Planning Log the terrain along SR 291 within the limits of the RDP varies as follows:

MP B-2.48 to MP 0.00 – Level Terrain

MP 0.00 to MP 22.31 – Rolling Terrain

Posted Speed

The posted speed limit along the SR 291 RDP corridor ranges from 35 mph to 50 mph as detailed in the table below:

Posted Speed Limit & Desirable Design Speed

Mile Post	Description	Posted Speed Limit (mph)	Desirable Design Speed (mph)
B-2.48	Freya Street to Division Street (City Arterial)	35	N/A
0.00	Division Street to Sanitary Landfill Vic. (Urban)	35	N/A
3.95	Sanitary Landfill Vic. to MP 7.53 (Urban)	50	55
7.53	MP 7.53 to MP 9.80 (Rural)	35	35
9.80	MP 9.80 to MP 12.48 (Rural)	50	55
12.48	MP 12.48 to Vicinity Wylie Drive (Rural)	40	40
14.40	Vicinity Wylie Drive to Scotts Valley Road	50	55

Source: WSDOT State Highway Planning Log, 2004 Planning Report

Design Speed

The choice of a design speed is influenced by functional classification, posted speed, operating speed, terrain, traffic volumes, accident history, access control, and economic (funding) factors. **However, a geometric design that adequately allows for future improvement is the major criterion, rather than strictly economics.** It is also essential to consider the geometric conditions of adjacent sections of highway as drivers typically expect to be able to maintain a uniform speed for a significant length of highway. It is desirable that the design speed and the posted speed correlate as follows:

Desirable Design Speed

Route Type	Posted Speed	Desirable Design Speed
Freeways	All	10 mph over the posted speed
Non-Freeways	45 mph or less	Not less than the posted speed.
	Over 45 mph	5 mph over the posted speed*

Source: WSDOT Design Manual Supplement-Design Speed, Figure 440-1, March 25, 2004

*This is a general guideline—the desired design speed for any one section of highway may differ based on WSDOT policy objectives or specific geometric concerns.

Per WSDOT Design Manual, Section 440.07, highway arterials that have obvious “street-like” characteristics, operationally and physically, do not require a design speed determination. In these situations, closely spaced intersections and other operational constraints ordinarily inhibit vehicular speeds, neutralizing the design speed factor.

Roadway Geometrics

The typical roadway section of existing SR 291 within the RDP limits, outside of the city limits, is a two-lane facility providing **11-foot lanes and 1-2 foot shoulders**. The auxiliary lanes on SR 291 are detailed in the following Tables:

Climbing Lanes		
SR 291 Northbound		
Mile Post		Length (Miles)
Begin	End	
12.45	12.80	0.35

Source: WSDOT State Highway Log, 2004 Planning Report

Two-Way Left Turn Lanes

Mile Post		Length (Miles)
Begin Lane	End Lane	
0.13	0.44	0.31
0.57	0.61	0.04
0.79	1.09	0.30
1.20	1.72	0.52
1.80	2.20	0.40
3.42	3.52	0.10
3.58	3.79	0.21
3.91	3.96	0.05
5.26	6.33	1.07

Source: WSDOT State Highway Log, 2004 Planning Report

Major Intersection Channelization

Mile Post	Intersection	Northbound		Southbound	
		Left Turn	Right Turn	Left Turn	Right Turn
B-2.48	Freya Street	Lane		Lane	
B-2.16	Market Street		Lane		Lane
B-1.51	Crestline Street	Lane		Lane	
B-0.74	Nevada Street	Lane		Lane	
B-0.37	Addison Street	Lane		Lane	
0.00	US2 / US 395 (Division Street)	Lane	Lane	2 Lanes	Lane
0.26	Whitehouse Street				
0.50	Wall Street				
0.66	Monroe Street				
1.12	Maple Street				
1.18	Ash Street				
1.50	Belt Street				
1.77	Alberta Street				
2.00	"A" Street				
2.21	Indian Trail Road		Lane	Lane	
3.00	Assembly Street	Lane	Taper		
3.07	Nine Mile Road Wye				
3.41	Royal Drive				
3.85	Rifle Club Road				
4.25	Windriver Drive				
5.22	Seven Mile Road	Lane		Lane	Taper
6.16	Kendick Road				Taper
9.11	Rutter-Parkway				
9.20	Charles Road				
12.98	Swenson Road	Lane	Lane	Lane	Lane

Mile Post	Intersection	Northbound		Southbound	
		Left Turn	Right Turn	Left Turn	Right Turn
13.36	Sunrise Drive				
13.82	Suncrest Drive				
14.35	Wylie Drive				
15.13	Moriah Drive	Lane			Taper
15.96	Jergens Road				
16.05	Whitmore Hill Road				
17.89	Lakeview Road				
18.41	Stonelodge Road				
21.36	McAlister Road				
22.31	Scotts Valley Road				

Source: WSDOT State Highway Log, 2004 Planning Report, 2003&2004 Aerial Photographs, and 2005 Srweb 2.2

No-Passing Zones

On the two-lane roadway section of SR 291, MP 6.50 to MP 22.31, within the RDP limits, approximately 81 percent of the northbound and southbound lanes are designated as no-passing zones at the following locations:

SR 291 Northbound			SR 291 Southbound		
Mile Post Limits		Length (Miles)	Mile Post Limits		Length (Miles)
Begin Zone	End Zone		Begin Zone	End Zone	
6.80	8.50	1.70	6.50	6.60	0.10
8.77	9.52	0.75	6.90	8.55	1.65
9.65	14.43	4.78	8.85	9.60	0.75
14.88	15.88	1.00	9.75	14.53	4.78
16.00	16.37	0.37	14.88	16.00	1.12
16.60	16.85	0.25	16.10	16.50	0.40
17.48	17.90	0.42	16.70	17.05	0.35
18.57	18.77	0.20	17.82	18.00	0.18
18.92	RDP Limits	3.39	18.70	18.87	0.17
		12.86	19.00	RDP Limits	3.31
TOTAL ZONE MILES		25.67			12.81

Source: WSDOT SR View 2003

Horizontal and Vertical Alignments

The segment of SR 291 corridor addressed in this Route Development Plan is located primarily along rolling terrain with a current posted speed limit of 50 mph. The speed for evaluating design elements on this section is 50 mph. Along Francis Avenue, from Division

Street to vicinity Nine Mile Road, the horizontal alignment consists of a series of horizontal angle points and tangents. Per WSDOT Design Manual Figure 620-1 “Maximum Angle Without Curve” the maximum angle point for a 50 mph design speed is 1°09’ deflection. The angle points are detailed in the following table:

Horizontal Angle Points

SR Mile Post	Central Angle (Degrees)	Direction (Lt./Rt.)	Superelevation (ft./ft.)	Maximum Allowable Angle	Exceeds Maximum
0.50	2°54.0’	Rt.	Crown Section	1°09’	Yes
0.60	1°25.9’	Rt.	Crown Section	1°09’	Yes
0.62	1°25.9’	Lt.	Crown Section	1°09’	Yes
0.99	2°42.5’	Lt.	Crown Section	1°09’	Yes
1.49	0°20.5’	Lt.	Crown Section	1°09’	No
2.00	0°01.0’	Rt.	Crown Section	1°09’	No
2.50	0°16.5’	Rt.	Crown Section	1°09’	No
6.54	0°23.4’	Rt.	Crown Section	1°09’	No

Source: WSDOT TRIPS System, Horizontal and Vertical Alignment Report
Approved Right of Way Plans, WSDOT

Horizontal Alignment – Radius and Superelevation

WSDOT evaluates superelevation rates along existing curves utilizing the following equation:

$$R = \frac{6.69 \cdot V^2}{(e + f)}$$

Where:

R = The minimum allowable radius of the curve in feet

V = Design speed in miles per hour

e = Superelevation rate in percent

f = Side friction factor based on design speed

Horizontal Curves

PC Mile Post	PT Mile Post	Radius (ft.)	Central Angle (Degrees)	Length (ft.)	Super elevation (ft./ft.)	Speed Limit (mph)	Minimum Allowable Radius (ft.) $R=6.69V^2/e+f$
2.97	3.02	1433.0	11°45.0’	294	Crown	35	468
3.04	3.13	400	69°02.4’	482	0.06	35	381

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PC Mile Post	PT Mile Post	Radius (ft.)	Central Angle (Degrees)	Length (ft.)	Super elevation (ft./ft.)	Speed Limit (mph)	Minimum Allowable Radius (ft.) $R=6.69V^2/e+f$
3.16	3.38	1400	48°24.6'	1183	0.04	35	420
3.41	3.59	1433	38°13.2'	956	0.06	35	381
4.95	5.15	1433	43°01.2'	1076	0.06	50	836
5.85	6.10	1917	40°35.0'	1358	0.05	50	880
6.81	7.02	1917	40°35.0'	1357.74	0.05	50	880
7.07	7.15	900.0	26°46.0'	420.5	0.06	50	836
7.30	7.46	900.0	54°43.0'	859.5	0.06	50	836
7.88	8.01	1909.0	18°59.1'	627.31	0.05	50	880
8.18	8.30	5000.0	1°41.6'	147.95	0.02	35	512
8.30	8.47	660.0	102°42.3'	1183.0	0.06	35	410
8.83	8.97	800.0	50°42.5'	708.0	0.05	35	431
9.04	9.07	600.0	13°39.8'	143.1	0.05	35	431
9.10	9.13	600.0	18°24.4'	192.75	0.05	35	431
9.21	9.53	926.4	45°16.7'	732.1	0.04	35	455
9.35	9.53	996.9	54°35.3'	949.8	0.05	35	431
9.70	9.78	716.2	36°37.9'	457.9	0.02	35	512
10.17	10.22	715.9	18°58.0'	237.0	0.05	50	880
10.29	10.33	716.2	17°37.0'	220.2	0.05	50	880
10.39	10.44	955.1	13°14.0'	220.6	0.05	50	880
10.45	10.55	716.3	41°42.0'	521.3	0.04	50	929
10.63	10.69	1432.2	11°08.0'	278.3	0.04	50	929
10.71	10.74	1432.8	07°09.0'	178.8	0.03	50	984
10.77	10.81	716.2	20°24.0'	255.0	0.03	50	984
10.95	10.98	1432.5	07°05.0'	177.1	0.03	50	984
11.01	11.06	1444.4	09°45.0'	245.8	0.03	50	984
11.21	11.25	1432.2	08°50.0'	220.8	0.03	50	984
11.34	11.35	954.9	06°00.0'	100.0	0.04	50	929
11.36	11.46	520.9	55°56.0'	508.5	0.06	50	836
11.49	11.58	573.0	51°27.0'	514.5	0.07	50	796
11.61	11.70	573.0	47°00.0'	470.0	0.07	50	796
11.73	11.81	573.0	43°00.0'	430.0	0.04	50	929

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PC Mile Post	PT Mile Post	Radius (ft.)	Central Angle (Degrees)	Length (ft.)	Super elevation (ft./ft.)	Speed Limit (mph)	Minimum Allowable Radius (ft.) $R=6.69V^2/e+f$
11.85	11.91	573.0	29°00.0'	290.0	0.04	50	929
11.95	11.98	573.0	16°36.0'	166.0	0.04	50	929
12.06	12.17	954.9	35°35.0'	593.1	0.06	50	836
12.17	12.38	800.0	79°20.0'	1107.7	0.06	50	836
12.45	12.49	1000.2	11°59.0'	209.2	0.07	40	487
12.61	12.69	370.0	71°36.0'	462.4	0.06	40	540
12.80	12.87	1000.0	21°23.0'	373.2	0.03	40	595
13.0	16.0	NA	NA	NA	--	--	--
16.04	16.14	572.9	48°17.0'	482.8	0.05	50	880
17.76	17.93	1909.8	26°59.0'	899.4	Crown	50	1045
18.67	18.78	1432.4	23°24.0'	585.0	0.06	50	836
19.01	19.14	954.9	40°20.0'	672.2	0.04	50	929
19.28	19.35	477.5	49°32.0'	412.8	0.06	50	836
19.37	19.44	573.0	35°49.0'	358.2	0.04	50	929
19.49	19.55	477.4	37°46.0'	314.7	0.04	50	929
19.64	19.70	477.5	39°28.0'	328.9	0.03	50	984
19.99	20.08	573.0	50°24.0'	504.0	0.03	50	984
20.31	20.40	716.2	36°53.0'	461.0	0.06	50	836
20.44	20.66	1431.9	46°02.0'	1150.4	0.06	50	836
20.93	21.08	573.0	81°10.0'	811.7	0.04	50	929
21.18	21.43	954.9	77°09.0'	1285.8	0.04	50	929
21.51	21.59	716.3	36°31.0'	456.5	0.04	50	929
21.61	21.78	1042.5	46°51'	852.5	0.04	50	929
21.86	22.01	1146.0	41°53'	837.7	0.03	50	984

Source: WSDOT TRIPS System, Horizontal and Vertical Alignment Report
Approved Right of Way Plans, WSDOT; Field Measurements
Horizontal Curve has radius below suggested minimum radius.

Vertical Curves – Section #2 and #3

BVC (mile post)	EVC (mile post)	Length (ft.)	Algebraic Difference in Grades (1) (% Grade)	Design Stopping Sight Distance (ft.)	Design Speed (mph)	Posted Speed (mph)
3.40	3.44	100	-0.36	1896	>80	35
3.67	3.69	200	-0.89	847	65	50
12.91	13.12	200	0.79	30000	>80	35-40
13.29	13.30	100	0.68	30000	>80	50
13.44	13.46	200	-1.87	455	45	50
13.64	13.66	200	1.06	30000	>80	50
14.11	14.13	200	2.22	898	70	50
14.27	14.29	200	-1.13	688	60	50
14.46	14.47	100	-1.16	623	55	50
14.63	14.65	200	0.80	30000	>80	50
14.86	14.87	100	-0.26	2606	>80	50
15.17	15.19	200	-1.32	603	55	50
15.43	15.51	500	1.18	30000	>80	50
15.79	15.80	100	0.31	30000	>80	50
16.31	16.39	450	-0.85	2071	>80	50

Source: Approved Right of Way Plans, WSDOT TRIPS System, Horizontal and Vertical Alignment Report

(1) Algebraic difference is positive for a sag curve and negative for a crest curve.

(2) Approximate curve location and length from TRIPS System

Vertical curve has a design speed less than posted speed.

Utilities

There are numerous aerial and buried utilities located along this segment of the SR 291 corridor. A detailed listing of recorded WSDOT franchises and permits is provided in Appendix D.

WSDOT has recorded the following utility holders within the RDP limits:

- Comcast Cable Co.
- Avista Corporation
- Inland Power & Light Co.
- Spokane County
- City of Spokane
- Stevens Co. PUD #1
- Qwest Corporation
- Bonneville Power Admin.
- Myron G. Bursell (Water)
- Scott J. Forshee (Sewer)
